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The effect of stock pay and stock holdings on the pay to performance sensitivity in Denmark

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Abstract

We explore the impact of stock pay and stock holdings on the pay to performance sensitivity in Denmark. Our research is motivated by the fact that most non-UK/US studies ignore stock based pay and stock holdings when measuring the pay to performance sensitivity. Further, most studies that explore the pay to performance relation apply the Black and Scholes approach assuming that the executive is both risk neutral due to hedge possibilities and well diversified. However, as pointed by Hall and Murphy (2002) executives are neither risk neutral nor well diversified. We adopt the certainty equivalence approach developed by Lambert et al (1991) to demonstrate that in a setting where executives are risk averse and undiversified there is a gap between the cost of granting stock options and the value, which executives receive from the same stock option program.

Our findings indicate that the Danish level of pay is lower than in the UK and the US but more in line with the pay in other Scandinavian countries. Further, our results show that stock options are less frequently used to compensate Danish executives. On the other hand, stock ownership seems to be a more popular way to align the interests of the management and the shareholders than stock options. Furthermore, including stock holdings affect our four pay to performance sensitivity measures significantly. We also demonstrate that the pay to performance sensitivity is considerably lower than indicated by the Black and Scholes approach. Finally, the pay to performance sensitivity is on average smaller in Denmark than in the US. However, the pay to performance sensitivity seems similar in Denmark and the UK.

Key words:

Pay to performance sensitivity, Black and Scholes, certainty equivalence framework, stock options, stock holdings.

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A key challenge of effective corporate governance is to alleviate the agency problem. Executives have goals that often conflict with the interests of shareholders. A way to alleviate the conflict is to align the incentives of executives with the interests of shareholders by granting stocks and stock options to the executives. An important measure of the efficiency of these incentives is the pay to performance sensitivity. Previous studies, measuring sensitivity, mostly rely on UK and US data. Non-UK/US firms are typically not required to disclose information on compensation for individual executives, and hence compensation data on individual executives have not been available to researchers. In cases, where individual compensation data are available, non-UK/US studies rely on salary and bonus (Kaplan 1994) and thereby ignoring stock options, stock awards and stock holdings. Our study addresses this issue by examining the pay to performance sensitivity among Danish executives. In contrast to most previous non-UK/US studies - attempting to measure the pay to performance sensitivity - our data contain information on cash pay (salary and bonus) as well as stock options and stock holdings.[1]

Our study is interesting for a number of reasons. First, the value of stock options applied in previous studies is estimated (in nearly all cases) using the Black and Scholes model.[2] One of the main assumptions in the Black & Scholes model is that the recipient is risk neutral due to hedge possibilities. However, the executive cannot hedge the risk and cannot sell the option because it is against the very purpose of granting stock options as incentive aligning instrument. Further, the executive – investing much of her human and financial capital in the firm – is inherently undiversified. Thus, we believe that the value of options to executives is lower than indicated by the Black & Scholes model. Hall & Murphy (2002) also find that the value of options to the executive is considerably lower than the estimated value based on Black and Scholes. Hall and Murphy (2002) employ a certainty equivalence framework developed by Lambert et al. (1991) to demonstrate that there exists a gap between the *cost* of granting stock options from the viewpoint of the firm and the *value* which executives receive from the same stock option program.

[1] Stock holdings are important to managerial incentives, but they are not part of pay. Thus, we make a distinction between flow of pay (e.g. stock options) and stock of equity.

[2] We make a distinction between the terms *cost* and *value* of stock options. The former refers to the cost of granting the stock options for the shareholders. The latter refers to the benefits that executives received from the same stock option program.

Second, Hall and Murphy (2002) do not apply firm specific data. Instead they introduce a list of assumptions that is required to estimate the value of a non-tradable option to an undiversified risk averse executive. One of the reasons for not adopting firm specific data is that extended data need to be gathered. These data may in many cases be difficult and time consuming to collect. We extend the Hall and Murphy (2002) study by applying firm specific data. This allows us to obtain a better understanding of the actual pay to performance sensitivity. Furthermore, we also document how much the traditional (Black & Scholes) techniques overestimate the pay to performance sensitivity on actual data using the certainty equivalence framework.

Third, previous studies ignore the impact of executives' stock holdings. The study by Hall and Liebmann (1998, 655) is a notably exception: "…..previous estimates ignored changes in the value of stock and stock options, which account for virtually all of the sensitivity. Indeed, for a given change in firm value, we find that changes in executive wealth due to stock and stock option revaluations are more than 50 times larger than wealth increases due to salary and bonus changes". There are strong arguments in favour of including stock holdings when measuring the total compensation. Obviously, executives' holdings of stocks affect their incentive. On the other hand, if stock holdings should serve its purpose (to provide incentives for better performance) there have to be restrictions on stock sales, otherwise risk adverse managers will readjust portfolios and thereby offset incentives from stock ownership. We add to the literature by exploring how stock holdings influence the pay to performance sensitivity. We apply two types of data; data that excludes executives' stock holdings and data that includes executives' stock holdings.

Fourth, previous studies disagree with the pay to performance sensitivity. Based on their empirical research Jensen and Murphy (1990) argue that executives are paid like bureaucrats rather than value-maximising entrepreneurs. On the other hand, Hall and Liebmann (1998) argue that Jensen and Murphy's sensitivity measure is affected by the time period examined. Jensen and Murphy's estimates of the relationship between pay and performance rely on data from 1969-1983, a period that predates the explosion in stock options issuance during the 1980s and 1990s. Hall and Liebmann (1998) apply a more recent data set (1980-1994). They find that the median elasticity of executive compensation with respect to market value more than tripled from 1.2 to 3.9 between 1980 and 1994. This total compensation elasticity for 1994 is about 30 times larger than previously reported salary and bonus elasticities, which ignore sensitivity generated by stock and stock option

revaluation. Further, non-US studies (including UK studies) find sensitivity measures that are significantly lower than found in especially US studies. We conjecture that part of the explanation for this difference is that previous studies applying non-US data ignore the effect of stock options and stock holdings. Institutional and cultural differences may also explain the difference in the sensitivity measures (Conyon and Murphy, 2000).

Finally, Danish compensation data are unexploited and the Danish institutional setting deviates from the US and the UK settings where most research on the pay to performance sensitivity has been carried out [Murphy (1999) and Conyon and Schwalbach (2000)]. The institutional setting in Denmark is characterised by a small open economy with a relationship-oriented corporate governance system, i.e. insider oriented (Eriksson and Lausten, 2000). Pedersen and Thomsen (1996) also document that the existence of dual stock classes in Denmark is related to a higher level of shareholder concentration. The relationships between insiders and the high level of ownership concentration lead us to believe that shareholders' monitoring of management plays a larger role in Denmark than in the UK and the US. We conjecture that the monitoring mechanism will reduce the need for stock based incentives such as stock options. We therefore expect that the pay to performance relation is weaker in Denmark than in the UK and the US.

Firth et al. (1996) argue that Scandinavian countries (including Denmark) generally have a low variability in wage levels compared to other European countries and the US. Further, they conjecture that the lack of large differences in the pay levels in the Scandinavian countries may be due to the state welfare philosophy, its tax system and the power of the trade unions. The low variability in compensation suggests that performance related pay such as stock options is less frequently used or the resulting payoffs are small in magnitude. Finally, variations in pay to performance sensitivities are most likely modest.

Gabrielsen et al. (2002) also document that the level of managerial ownership in Denmark is significantly higher than in the US. Companies characterised by a high level of managerial ownership have already aligned the interest of the principal and agent. Thus, performance related compensation (i.e. bonuses and stock options) is not expected to be used to the same extent as a means of motivating management. The high level of managerial ownership in Denmark also stresses the importance of examining the impact of stock holdings on the pay to performance

sensitivity as pointed out above. In summary, the Danish institutional setting offers an interesting and relevant setting for examining the pay to performance sensitivity.

Since compensation data are not readily available in Denmark for the time period covered, we collect the data through a questionnaire mailed to companies listed on the Copenhagen Stock Exchange. The compensation data cover the time period 1999-2001. Our data on compensation include detailed information on the amount of stock options granted during the years, as well as the exercise prices and durations of the options. As pointed out by Murphy (1999) the coefficient on sensitivity of pay is in most cases assumed constant across firms. Our data (and approach) allows the coefficient on sensitivity of pay to vary across firms. Thus, since we know the functional form of the relation between the compensation and the performance measures, we are able to obtain a better understanding of the variation in the sensitivity of pay between firms.

Our results provide some interesting insights into the pay to performance sensitivity in Denmark. First, our results confirm that stock options are less frequently used to compensate Danish executives. Less than 50% of the executives receive stock options as part of the total compensation package. Second, more than 50% of the executives in our sample own stocks. Thus, in line with our predictions stock ownership seems to be a more popular way to align the interest of management and shareholders in Denmark. Furthermore, including stock holdings affect our four pay to performance sensitivity measures significantly. We believe this result is interesting as most research on compensation ignores the effect from stock holdings. Finally, with Hall and Murphy (2002) as a notably exception previous empirical research on compensation adopt the Black and Scholes approach assuming that the executive is well diversified and risk neutral due to hedge possibilities. We demonstrate that the pay to performance sensitivity is significantly lower than indicated by the Black and Scholes approach under the assumption that executives are neither risk neutral nor well diversified.

The remaining of this paper is organised as follows. The next section contains a literature review. In the third section the research design is outlined. The sample selection and descriptive statistics are provided in the fourth section, followed by empirical results and sensitivity checks. Conclusions and suggestions for future research appear in the final section.

Prior literature

In their seminal work Jensen and Murphy (1990) find that executive wealth in the US increases by $3.25 for every $1,000 increase in shareholder wealth. They conclude that this increase is low. Jensen & Murphy's measure of sensitivity has been criticised because it is likely to be seriously biased by size. It is obvious that a change in wealth of $3.25 for a $1,000 change in shareholder wealth is likely to give large changes in executive compensation for companies with large market caps, while the change is moderate for companies with small market caps. This size bias is to some extent examined by Jensen and Murphy (1990). They find that the sensitivity in large (small) firms is $1.85 ($8.05) per $1,000 change in shareholder wealth. Further, Jensen and Murphy (1990) apply the Black and Scholes (1973) stock option formula. As pointed out by Hall and Murphy (2002) an executive's perceived value of a stock option might differ significantly from Black and Scholes values.

Hall and Liebmann (1998) examine the pay to performance relation for the largest, publicly traded US firms. The main contribution from Hall and Liebman (1998) is based on simulation of price movements and their effects on stock based compensation. Holding constant direct compensation they estimate the magnitude of compensation changes following 'normal' rates of stock return. They apply a data set containing detailed information on executives' holdings of stock and stock options and are, therefore, able to produce precise and comprehensive measures of the relationship between firm performance and executive pay. They document a large increase in executives' holdings of stock and stock options from 1980 to 1994. They also report a variety of measures of the relationship between pay and performance and find a strong link between the fortunes of executives and the fortunes of the firms they manage. They find that essentially all of the pay to performance sensitivity is attributable to changes in the value of executives' holdings of stock and stock options. Their study is interesting as it demonstrates the increase in use of stock based compensation and critically examines the fact that many earlier studies did not take stock pay and stock holdings into account when conducting pay to performance studies (see below). The caveat is, however, that it is still not evident if stock ownership should be taken into account when evaluating the performance relation. The argument against stock ownership is that to provide incentives for better performance there have to be restrictions on stock sales, otherwise risk adverse managers will readjust portfolios and thereby offset incentives from stock ownership. Further, Hall and Liebman (1998) also adopt the Black and Scholes framework, which is likely to exaggerate the pay to performance sensitivity.

Hall and Murphy (2002) demonstrate that there exists a gap between the cost of granting stock options from the viewpoint of the firm and the value which executives receive from the same stock option program. In fact, they demonstrate that the value of stock option programs to the executive is considerably lower than the cost of granting them. The main problem is that executives are risk averse in contrary to the important assumption in the Black and Scholes model that the recipient is risk neutral due to hedge possibilities. The executive cannot hedge the risk and cannot sell the options because it is against the very purpose of granting stock options as an incentive aligning instrument. Hall and Murphy (2002) adopt the certainty equivalence framework developed by Lambert et al. (1991) and demonstrate (by simulation) that under these circumstances, the value of options to the executive is considerably lower compared to values estimated based on traditional techniques (Black and Scholes). No research has (to the authors' knowledge) applied the certainty equivalence framework to real world data primarily due to the fact that extended data need to be gathered. In a related study, Ikäheimo et al. (2006) examine the value of Finnish executive stock options listed on the Helsinki Stock Exchange. They find a price differential compared to the standard Black and Scholes model, with price differential averaging 15%. This supports that the value of executive stock options are considerably lower than indicated by the Black and Scholes model.

Zhou (1999) compares the pay to performance relationship in the US and Canada. He finds that the pay to performance sensitivity is considerably higher in the US than in Canada. For every $1,000 increase in shareholder wealth the US (Canadian) executives' wealth (including direct pay and stock holdings)[3] increases $4.11 ($0.6). One explanation for the different sensitivity measure across Canadian and US firms is that the incentives provided by stock ownership is smaller in Canadian firms than in US firms. As in Jensen and Murphy (1990), Zhou also finds that the sensitivity measure decreases as firm size increases.

A range of UK studies examine the pay to performance sensitivity. Main et al. (1996) is the first study that includes stock options when measuring executive pay. By including the stock option component of pay along with the cash pay they find that executive pay is more sensitive to company performance than had previously been thought to be the case in the UK. By adopting a

[3] Due to poor data quality Zhou ignores stock options.

more recent time series (1992-1995), McKnight and Tomkins (1999) find that executive pay is significantly more sensitive to company performance than detected in Main et al. (1996). This result is primarily driven by the increasing impact of stock option on overall pay. They provide evidence that stock options represent nearly 41% of an executive's overall pay in 1995 as compared to 26% in 1993. Buck et al (2003) include all types of executive rewards when measuring executive pay. Although they find that executives' absolute pay is positively affected by including all types of rewards the pay to performance relation is still modest in comparison with the US.

Conyon and Murphy (2000) compare pay to performance sensitivities among UK and US firms. They find that the US executive receives 4.18% of any increase in shareholder wealth compared to 2.33% in the UK. Conyon and Murphy argue that the differences in sensitivity can largely be attributed to greater stock options awards in the US arising from institutional and cultural differences. In valuing stock options, they apply the Black and Scholes formula. Finally, Conyon and Schwalbach (2000) compare the pay to performance link in the UK and Germany. They find that pay to performance sensitivity measures are similar in the UK and Germany. However, Conyon and Schwalbach do not include the impact of long-term incentive plans. Since these plans are more common in the UK they argue that the pay to performance link is most likely stronger in the UK than in Germany.

As pointed out by, for example, Kato et al. (2004) systematic research on executive compensation outside the UK and the US is still relatively scarce mostly due to limited data availability. Non-UK/US firms are typically not required to disclose information on compensation for individual executives, and, hence, compensation data for individual executives have not been available for researchers. Most often, non-UK/US studies rely on executive compensation such as salaries and bonuses. Stock options, stock awards and stock holdings are normally not included in the data set used by researchers. For example, Brunello et al. (1996) on Italian data, Eriksson and Lausten (2000) on Danish data, Kato and Kubo (2003) on Japanese data and Kato et al. (2004) on Korean data all ignore stock options, stock awards and stock holdings when estimating the pay to performance sensitivity. They argue that the omission of those less visible forms of executive compensation may not pose as serious a problem as in the case of the UK and the US. Except for perquisites these forms of compensation are not as wide-spread in non-US countries as in the UK and the US. Even if the amount of these less visible forms of compensation is present, the neglect of

these types of compensation would not be a problem insofar as movements in these types of compensation and cash compensation (salary and bonus) are correlated (Kato and Kubo 2003 and Kaplan 1994).

In summary, UK and US studies tend to apply the Black and Scholes model which overestimate the value of stock options received by executives. Further, non-UK/US studies most often ignore stock options and stock holdings due to data limitations.[4] Our objective is to estimate the pay to performance sensitivity in Denmark taking into account stock options and stock holdings. Further, we apply both the Black and Scholes and the certainty equivalence valuation framework. The aim is to document the *magnitude* by which traditional equity techniques (Black and Scholes) overvalue holdings of equity-based compensation in Danish companies. Furthermore, the purpose is also to document how much the traditional techniques overestimate the pay to performance *sensitivity*.

The value/cost of employee stocks and stock options

Black and Scholes (1973) demonstrate that, since investors can hedge, options can be valued as if investors were risk neutral and all assets appreciate at the risk free rate. Given these assumptions, the cost of options can be estimated by calculating the expected value of the option upon exercise assuming that the expected return on the stock is equal to the risk free rate, and then discounting the expected value to the grant date using the risk free rate. In general, Black and Scholes assumptions describe reasonably well the situation faced by outside investors holding stock options. However, executives cannot trade or sell their options and are not allowed to hedge the risk by short selling company stock. Further, outside investors tend to be well diversified. Executives, on the other hand, are typically undiversified. Thus, the Black and Scholes approach does not measure the value of a non-tradable option to an undiversified, risk averse executive.

The literature has recognized that market imperfections create divergence between managers´ and shareholders´ valuation of a component of a compensation scheme in cases where moral hazard and adverse selection arise (see e.g., Lambert et al., 1991 and Muelbroek, 2001). In order to provide a more realistic valuation framework we adopt the certainty equivalence approach as in Lambert et al. (1991) and Hall and Murphy (2002). The certainty equivalence approach estimate the value of a non tradable option to an undiversified risk averse executive as the amount of riskless cash

[4] In fact, most UK and US studies also ignore stock holdings.

compensation the executive would exchange for the option. The certainty equivalence approach is briefly described below.[5]

Assume that the manager is offered a contract at the beginning of the period specifying, that at the end of the period he will be paid Z(P) as a function of his performance, represented by the variable P. Z(P) and P might represent an employee stock option plan and the stock price, respectively. Assume in addition that the manager's other wealth, which is not pay, is partitioned into two components. The payoff from the first component is assumed to be non-stochastic, with a value equal to W, and the payoff from the second component is assumed to be equal to MP which is stochastic following the nature of P. Therefore, the payoff from the manager's other wealth is W + MP. This simple linear structure allows for a focus on the parameters W and M, which determine both the level of the manager's other wealth and its sensitivity to P. U(x) represents the managers utility when the total payoff from all of the components of his wealth is x. It is assumed that the manager is risk adverse.

The value is then determined as the amount of cash (C) the manager would require, should he give up the compensation contract given the composition of the remainder of his wealth. This can be expressed by the following equation:

$$\int_0^\infty U(W + MP + Z(P))\, f(P)\partial P = \int_0^\infty U(W + MP + C)\, f(P)\partial P$$

The left-hand side represents the managers expected utility from the uncertain compensation contract payoff and the right-hand side represents the utility from the certainty equivalence payoff which provides the manager with the same level of utility.

To apply this valuation principle in practice, it is necessary to impose additional structure on the functions, particularly the compensation contract, the utility function, and the distribution of future stock prices. For comparative purposes we follow the Hall and Murphy (2002) approach. First of all, they limit their application of the model to include only stock option compensation. We extend

[5] Lambert et al. (1991) and Hall and Murphy (2002) provide a more comprehensive introduction to the certainty equivalence approach.

it to include employee stocks as well. This implies that Black & Scholes (BS) can be implemented as an approximation of the compensation function. Furthermore, they assume that the executive has constant relative risk aversion ρ, so that $U(W) \equiv ln(W)$ when $\rho=1$, and $U(W) \equiv (1/(1-\rho))W^{1-\rho}$ when $\rho \neq 1$. Lastly, they adopt the Capital Asset Pricing Model (CAPM) and assume that the distribution of stock prices in T years is lognormal with volatility σ and expected value equal to $(r_f + \beta(\tilde{r}_m - r_f) - \sigma^2/2)T$, where β is the firm's systematic risk and r_m is the return on the market portfolio. In the following section each of the variables listed above are described.

Sample selection and descriptive statistics

Sample selection

Many early empirical studies utilise annual reports or proxy financial statements as the only source of data. This approach is, however, not possible in Denmark. Prior to 2005 companies were not required to provide information on options to executives. Further, in Denmark no databases present structured data on executive compensation. Therefore, the only way to conduct research in Denmark in relation to executive compensation is by collecting data using a survey.

A questionnaire (survey) was constructed and mailed to all members of the management board of directors in listed Danish companies. The survey contained questions regarding the members' salaries, bonuses, stock options and stock holdings.

The survey was mailed to 283 members of the management board of directors in Denmark. A member of the 'management board' is defined by law as a director who is required to sign the annual report[6]. A total of 128 companies listed on the Copenhagen Stock Exchange were included in the survey. The companies were all non-financial companies.[7]

The recipients were the members of the respective management boards as of April 1st 2002. Information on executives was initially gathered from Greens[8] but updated and supplemented by hand collected information from web sites, annual reports etc. To ensure a high response rate the

[6] Danish Company Act (Aktieselskabsloven).
[7] The survey was part of a larger research project involving accounting data as well. Consequently, non-financial firms were excluded from the survey.
[8] A Danish information broker.

respondents were guaranteed anonymity. Even though executives might receive bonus, stock options, and stock awards they might not know the exact terminology used in the compensation literature. This problem was addressed by using the first page of the questionnaire to clarify definitions of different elements of compensation. The final questionnaire was sent to 11 executives as part of a pilot test and 6 were returned. The survey was conducted in two terms; July 9th 2002 and September 12th 2002. This resulted in 77 responses, which gives a response rate of 27.2%. The responses came from 58 companies, which give a response rate of 45.3% (see table 1). This is an acceptable response rate compared to other surveys (Gibbs et al., 2004 and Graham and Harvey, 2001).

[Insert table 1]

Several companies have chosen one member of the management board to represent the company as a whole. 15 companies were represented by more than one respondent and the maximum number of respondents from one company was three (not reported in the table). Since some respondents did not complete the questionnaire entirely some compensation data are missing. Therefore we reported a third column in table 1 which indicates the lowest possible number of observations in our test. We obtained a complete dataset for 34 companies and 41 respondents. In our subsequent tests we report our results based on 41 observations. However, in order to examine the robustness of our findings, we repeated all tests based on 34 observations. If possible we also re-examined our basic findings based on the maximum size of our sample. Since data are available all descriptive statistics are based on the maximum number of observations.[9]

If possible the questionnaire data were checked against information in the annual reports. We generally found that the information provided in the questionnaire matched the information provided in the annual report. This gave us some comfort about the quality of the data.

The cost of an option using the Black and Scholes methodology requires data on six variables: the exercise price, stock price, dividend yield, stock-return volatility, risk free rate and time until expiration. The certainty equivalence approach adopted in this study also depends on these six variables and in addition to the executive's risk aversion, initial wealth, and diversification. Further,

[9] Although not reported the descriptive statistics remain identical with a sample of 41.

the risk premium and beta are used to estimate the expected stock price as required by the certainty equivalence approach.

As a proxy for the *risk free rate of return* the yield on a five-year government bond is used. This practice is followed in other Danish studies on option valuation (Bechmann and Jørgensen, 2002) and is chosen mainly to match the option terms observed in Danish option programs. The risk free rate was collected from the yearbook of Danmarks Statistik.[10]

The *risk premium* on the Danish market is estimated at 3.2%[11] based Parum (2001), who estimate the risk premium on the Danish market portfolio using a variety of estimation procedures and estimation techniques.

The estimation of *beta* is based on monthly observations of historical stock prices for a period of 5 years prior to the grant date. *Volatility* is calculated based on monthly historical price observations for a period of 5 years prior to the valuation date. This matches the mean option term for granted stock options and is similar to prior research (Jensen and Murphy, 1990). The *dividend yield* is calculated based on the dividend per share data from Account Data[12] and average share price for the same year calculated based on monthly observations. *Current stock price* is the stock price as recorded by Account Data.

The *option term* is obtained based on information in the questionnaire. The respondent was asked to specify the grant date/period and the expiration date for the option. The option term is then estimated by calculating the number of years from the valuation date (grant date as the earliest) to the expiration date.[13] The information about *exercise price* is gathered from the questionnaire and from sources such as annual reports and the internet.

[10] Danish statistical database
[11] As pointed out above, CAPM is used to estimate the distribution of future stock prices.
[12] Account Data collects and codes stock prices and data from the annual report, in a structured form, from Danish listed companies.
[13] Out of the 55 grants which are included in the survey, 10 grant dates are estimated based on grant year information. For 10 observations the expiration date is estimated based on information about expiration year. In these cases the month is estimated based on knowledge about fiscal year, as many option programs are granted at the general shareholder meeting. When the grant date or expiration date was imprecisely presented in the questionnaire the information was checked on the internet and in the annual report. Some respondents even indicated that more precise information was made available through those sources.

The information on *number of options* and *stock holdings* was gathered primarily from the questionnaire but also from other publicly available sources. In a few cases the number of options was estimated based on information about option grants to the management board in general (only knowledge about total number of options to the management board was available and the average of total grants was used as an estimate for the number of options each executive received).

Three measures in our study are based on estimates. *Total wealth of the manager* is estimated to be DKK 5,000,000, which seems fair taking into account that both small and large companies are represented. One might argue that larger companies have more wealthy managers and therefore wealth should be a function of size. As an additional sensitivity test wealth of the manager is proxied as a function of sales (0.1% of sales). *Risk aversion* is an economic concept, of which it is hard to establish any empirical estimates. Hall and Murphy (2002) use estimates of constant relative risk aversion of 2 and 3 in their sensitivity analysis. Our study includes 1 as an additional test. Hall and Murphy (2002) indicate that risk aversion of 2 and 3 is at the low end of the spectrum as it has been suggested in the literature that risk aversion coefficients may be as high as 20 (Mehra and Prescott, 1985). However, our sensitivity analysis reveals that coefficients of risk aversion at that level would leave us with values of stock options so low that no utility or incentives would be gained from executive stock options. Finally, we utilize *percentage of wealth tied to the company* (diversification) of 10%, 25%, 50%, 75% and 90%.

It should be noted that the different measures for *wealth*, *risk aversion* and *wealth tied to the company* also reflect the limitation of the certainty equivalence approach. The certainty equivalence approach requires information that is not available. In this study we address the problem by using estimates for these variables that make comparison with prior studies possible (Hall and Murphy 2002 and Lambert et al. 1991). Further, we use different values for each of the three variables in order to understand their influence on the pay to performance estimates based on the certainty equivalence approach. Accordingly, pay to performance sensitivity measures based on the certainty equivalence approach should not be seen as exact values.

Below, our variables are summarised. Hall and Murphy (2002) is the only prior study that applies the certainty equivalence approach on compensation data and consequently, the values used in their study are included for comparative reasons.

	Our study	Hall and Murphy	
	Data from external databases		*Variable used in*
Risk free rate	Time specific	6%	B&S[a] and CE[b]
Dividend yield	Firm specific	No dividends	B&S and CE
Current stock price	Firm specific		B&S and CE
Volatility	Firm specific	30%	B&S and CE
Beta	Firm specific	1	CE
	Data from questionnaire		
Exercise price	Firm specific	30$	B&S and CE
Time to expiration (option term)	Firm specific	10 years	B&S and CE
Number of options	Firm specific		B&S and CE
Number of shares	Firm specific		B&S and CE
	Estimated data		
Risk premium	3.2%	6,5%	CE
Executive's wealth (w)	5 million DKK or 1% of sales	5 million $	CE
% of wealth in company share	0% 10%, 25%, 50%, 75% or 90%	50% or 67% of wealth in company share	CE
Relative risk aversion (ρ)	1, 2 or 3	2 or 3	CE

a. Black and Scholes approach
b. Certainty equivalence approach

Descriptive statistics

As the respondents were guaranteed anonymity it is not possible to reveal their identity. In a study like ours, their individual characteristics are, however, more important than their specific identity. As the respondents are well known to the researchers, it is, however, possible to draw a detailed picture of the respondents as a group. The characteristics are interesting because they make it possible to compare with other studies and they indicate whether the sample is representative for the population as a whole.

[Insert table 2 here]

As reported in table 2 the mean (median) age of the respondents is 49.8 (50) years. The youngest (oldest) respondent is 34 (65) years. Further, the average (median) number of years of employment in the management is 10.4 (8) years.

[Insert table 3 here]

Table 3 divides the participating firms (respondents) into industries using the industry definition of the Copenhagen Stock Exchange. All major industries are included in the sample. Further, companies from health care and materials are more frequently represented in the sample than other industries. Telecom and utilities are not represented in the sample which can be explained by their small representation on the Copenhagen Stock Exchange. As shown in table 3 there are only one telecom and two utilities listed on the Copenhagen Stock Exchange. Further, the size of the firms included in our sample matches the size of the average firm listed on the stock exchange. The average market value (turnover) of firms included in our sample is DKK 5.1 (3.7) billion while the average market value (turnover) of listed firms is DKK 4.3 (3.5) billion.

Since participation by firms and managers in the survey is voluntary our data may be affected by a self selection bias. However, based on the descriptive statistics we believe that our sample is representative of the Danish stock market on criteria such as industry and size.

Table 4 panel A reveals that 41 (53%) receive bonuses and 39 (51%) receive stock options as part of the total compensation package. Further, 50 (65%) hold stocks in the company. Table 4 panel B shows how the various incentive pays are used. From the table 4 panel B it becomes clear that some kind of an incentive is included in most compensation contracts. Only 7 executives or less than 10% of the sample are paid a salary only. 18 use a combination of bonus, stock options and stock ownership. 17 is using bonus combined with stock options or stock ownership. 7 use a combination of stock options and stock ownership. 18 rely only on stock ownership. The extensive use of stock ownership underlines the importance of this type of incentives among Danish listed companies.

Finally, table 5 provides descriptive statistics on salary, bonus, stock options and stock ownership. In the questionnaire, salary is reported as a categorical variable. The majority of respondents receive a salary between DKK 750,000 and DKK 2,250,000. If we apply the median value of each categorical variable we obtain an average salary of DKK 1,835,000 in 2001 which corresponds to

US$ 228,000.[14] If we compare our results with the executive compensation in other countries as reported in figure 4 in Murphy (1999), Danish executives receive a lower level of salary than executives in the US and UK.[15] On the other hand, the salary reflects the level of salary of Swedish executives. Bonus makes up approximately 20% of the salary. This corresponds fairly well with bonus paid to executives in other countries as reported by Murphy (1999). Stock options are less frequently used to compensate Danish executives. The mean value of stock option holdings is DKK 1.1 million. Finally, more than 50% of the executives in our sample own stocks in their firm and on average they own 3.7%. Thus, stock ownership seems to be more popular than stock options among Danish executives.

Empirical results

In the following section we present and discuss our empirical results. As pointed out in the motivation our objectives are to document both the *magnitude* by which traditional equity techniques (Black and Scholes) overvalue holdings of equity-based compensation in Danish companies and to document how much the traditional techniques overestimate the pay to performance *sensitivity*. Furthermore, the impact of stock holdings on the executive pay is also examined. As reported in the introduction and in the descriptive statistics managerial ownership is common in Denmark.

Magnitude

First, we examine the magnitude by which traditional techniques overvalue stock holdings and stock options in Danish companies. Our measure of total compensation includes salary and bonus, changes in the value of stock option holdings, and changes in the value of stock holdings.[16] In order to examine the impact of stocks and stock options we hold salary and bonus constant. Since one of our objectives is to study the impact of stock holdings on the total compensation, we report changes in value of stocks and stock options separately.

Because we have detailed data on executive stock option holdings and stock holdings, we are able to calculate changes in each executive's wealth that occurs in response to various changes in the

[14] Exchange rate as of 31. December 2001.
[15] Please note that descriptive statistics on salary in Murphy (1999) is based on 1997 figures.
[16] Since the change in value of stock holdings is important to managerial incentives it is included in our (broad) measure of total compensation.

firm's market value. In line with Hall and Liebmann we apply the distribution of stock returns from 1999 to 2001 for all companies listed on the stock exchange. The different decile cutoffs are shown at the top of table 6. For example, the mean (median) return is 14% (0%) whereas the return at the tenth percentile is negative 42%. The ninetieth percentile return is 61%. Based on our detailed compensation data and distribution of stock returns we can simulate the different levels of total compensation for each executive.

Based on data from our questionnaire we calculated the total compensation for each executive in our sample in 2001[17]. Total compensation varies according to the distribution of stock return. We simulate six levels of total compensation for each manager. The first column of table 6 shows the mean compensation for all executives assuming that each company perform at the tenth percentile rate of return. The first two rows show the mean compensation of salary and bonus (expressed as a percentage of salary). These components of total compensation are assumed to be insensitive to firm performance, and therefore have identical values across different expected performance levels.

The next two rows (panel A) shows the change in value of stock options and stock holdings across different expected performance levels. The values that are based on the Black and Scholes formula show great variation across different performance levels. For example, a tenth percentile performance leads to an average loss of DKK 22 million. Stock options and stock holdings affect total compensation by DKK -0.515 million and DKK -23.4 million, respectively.[18] The combined loss from stock options and stock holdings is approximately 11 times the size of the average salary (including bonus). A mean (median) stock performance generates an average total compensation of DKK 9.9 (1.8) million. A ninetieth percentile performance generates a total compensation of DKK 36.8 million. If we compare our results with the results reported in Hall and Liebmann (1998) total compensation is lower in Denmark than in the US. However, the variation across different expected performance levels remains the same. Further, stock holding is the most important component of total compensation in both countries and it stresses the importance of including stock holdings when measuring total compensation.

[17] Since we only have data on stock options from 1999 to 2001 our value estimates on stock option holdings are most likely conservative.
[18] Since stock options received prior to 1999 are not included in our calculation the impact of stock options on total compensation is most likely understated.

The results reported in table 6 panel B-E document the magnitude by how much the Black and Scholes formula overvalue holdings of stock options and stocks in Danish companies. Since the management is assumed to be undiversified and risk averse we have also adopted the certainty equivalence approach on stock holdings. The results reported in panels B-E are based on different levels of risk aversion and wealth invested in the company. In panel B we assume that the risk aversion is 3, total wealth of the executives equals DKK 5 million and 75% of the executives total wealth is invested in the company. Assuming a tenth percentile performance, the average executive in our sample loses DKK 6.7 million. This corresponds to a compensation differential of DKK 15.3 million. This tendency remains the same across different levels of expected performance. If we assume a mean performance, the total compensation based on the certainty equivalence approach is DKK 5.2 million. This is DKK 4.6 million lower than total compensation based on the Black and Scholes approach. With a ninetieth percentile performance the Black and Scholes approach overvalues the total compensation by DKK 21.5 million. Similar findings are found when different assumptions of risk aversion and wealth invested in the company are applied (panel C-E). Thus, based on Danish data our findings support that traditional techniques overestimate the actual value which executives receive from stock options and stock holdings.

Sensitivity

In table 7 panel A-D we report different sensitivity measures of pay to performance. In all cases, we assume that salary and bonus is held constant, allowing only variation resulting from change in value of stock option holdings and stock holdings.[19] We report two set of data for each sensitivity measure. One set of data is based on the Black and Scholes approach and another set of data is based on the certainty equivalence approach. The objective is to document how much the traditional Black & Scholes approach overestimates the pay to performance sensitivity on Danish data using the certainty equivalence framework.

Table 7 panel A shows the dollar amount by which executive compensation changes if the firm's stock price increases from a median performance (0%) to seventy-fifth percentile performance (25%). The mean change is shown in the first column, and the next five columns show different cutoffs of dollar changes ranked from the smallest to the largest. The first row of data reports the sensitivity created by holdings of stock options using the Black and Scholes approach. The data

[19] This is done in order to compared with the results of Hall and Liebmann (1998).

reported in tabel 7 panel A shows that moving from a median performance to a seventy-fifth percentile increases executive wealth by DKK 0.356 million at the mean and DKK 0 million at the median. At the ninetieth percentile executive wealth increases by DKK 0.527 million. The low numbers reflect the fact that more than 50% of the executives do not hold stock options. Further, more than 50% of the stock options are out-of-money in 2001. This will tend to bias the PPS measures downwards.[20]

The second row reports the same calculations, including executives' stock holdings in their firms. The changes are much larger. The mean change is DKK 14.3 million and the median increase is DKK 0.6 million. It reflects that the median executive only holds a few stocks in their firm. Further, a few executives hold a significant amount of stocks in their firms which corresponds with the data reported in descriptive statistics. This is also confirmed by examining the ninetieth percentile where the change is DKK 26.9 million.

In the third and fourth rows (panel A) we report similar statistics based on the certainty equivalence approach. The changes are, as expected, much smaller than changes based on the Black and Scholes approach. For example, the mean change from moving from the fiftieth percentile performance to the seventy-fifth percentile performance is DKK 5.3 (0.05) million for stock holdings and stock option holdings (stock option holdings only). Thus, the results reported in the third and fourth row support that pay to performance sensitivities based on the Black and Scholes approach are significantly overvalued.

Panel B in table 7 reports another sensitivity measure of pay to performance. Panel B reports change in compensation as a percent change rather than a dollar change. The percent change in the first two rows in panel B is based on the Black and Scholes approach while the percent change in the third and fourth row is based on the certainty equivalence approach. The percent change based on the Black and Scholes approach is considerably larger than the percent change based on the certainty equivalence approach. For example, the mean change of moving from the fiftieth percentile performance to the seventy-fifth percentile performance improves the average value of stock options by 32.4% if the Black and Scholes approach is adopted and only 1.58% if the

[20] Gregg et al. (2005) find that the pay to performance sensitivity measure is biased downwards in the bear market around 2000. Since we adopt the simulation methodology the estimated sensitivity measures are only modestly affected by the bear market in 2000 and 2001.

certainty equivalence approach is adopted. Similar, the percent change in the value of stock options and stock holdings is 1087.4% if the Black and Scholes approach is used and 296.8% if the certainty equivalence approach is applied.

The mean elasticity and the distribution of elasticites of compensation, from smallest to largest, are reported in panel C in table 7. The elasticity is the percentage change in total compensation divided by the percentage change in firm value. The percentage change in compensation is calculated as the difference between the total compensation of each executive at the fiftieth percentile, and at the seventy-fifth percentile. Assuming that the executive only holds stock options the mean (median) elasticity based on the Black and Scholes approach is 1.29 (0.00). The mean (median) elasticity based on the certainty equivalence approach is 0.06 (0.00). When stock holdings are included the elasticities are affected positively as expected. When the Black and Scholes approach is used the mean (median) elasticity increases to 43.50 (1.00). The mean (median) elasticity is 11.87 (0.24) when the certainty equivalence approach is used. As indicated by the mean and median values our results are driven by a few extreme observations. For example, the ninetieth percentile of executive elasticities is 66.7 (32.2) when the Black and Scholes (certainty equivalence) approach is used.

Finally, we calculate the Jensen and Murphy statistic, i.e. how much executive wealth changes relative to DKK 1000 changes in firm value. We find that a DKK 1000 change in firm value increases executive wealth by DKK 69.4 at the mean and DKK 1.91 at the median if the Black and Scholes approach is used and 32.2 at the mean and 0.29 at the median if the certainty equivalence approach is used. While the mean values are higher than those reported in Hall and Liebmann (1998) the median values are smaller. This supports that our results are driven by a few extreme observations.

Our results provide some interesting insights on the pay to performance sensitivity in Denmark. First, our results indicate that stock options are less frequently used to compensate Danish executives. Less than 50% include stock options as part of the total compensation package. If we, for example, compare our results with the results reported in Hall and Liebmann (1998), we find that stock options are much more popular among US executives. More than 80 percent of the executives in their sample receive stock options as part of total compensation. Second, more than 50% of the executives in our sample own stocks. Thus, stock ownership seems to be more popular

than stock options among Danish executives. Furthermore, including stock holdings affect our four pay to performance sensitivity measures significantly. Hall and Liebman (1998) find similar results. Thus, in settings like the Danish where stock holdings are more important than stock options, we believe that it is important to include stock holdings when measuring the pay to performance relationship. We believe this result is interesting as most research on compensation ignores stock holdings. Third, the statistics on stock ownership reported in our study seems surprisingly similar to the stock ownership reported in Hall and Liebman (1998) on US data. The mean (median) stock ownership among executives is 2.2% (0.14%) in the US and 3.7% (0.1%) in our (Danish) sample. Fourth, we demonstrate that that the pay to performance sensitivity is significantly lower than indicated by the Black and Scholes approach. While Hall and Murphy (2002) is a notably exception previous empirical research on compensation seem to adopt the Black and Scholes approach assuming that the executive is risk neutral due to hedge possibilities and is well diversified. Finally, if we ignore extreme stock holdings the pay to performance sensitivity is on average smaller in Denmark than in the US but more in line with the findings in the UK (see e.g. Conyon and Murphy, 2000 and Buck et al., 2003).

Sensitivity analysis

The results reported in table 7 panel A-D assume a risk aversion of 3 and 75% of the executives wealth invested in the company. We repeated the analysis and assumed a risk aversion of 2 and 1, respectively and 50% of the executives wealth invested in the company. While it affects the sensitivity measures positively, when the certainty equivalence approach is used, it does not change our underlying findings. For example, if we change the executives' wealth invested in the company from 75% to 50% the mean change from moving from the fiftieth percentile performance to the seventy-fifth percentile performance is changing from DKK 5.3 million to DKK 5.4 million for stock holdings and stock option holdings.

The results reported in table 7 are based on the amount by which executive compensation changes if the firm's stock price increases from a median performance (0%) to 75 percentile performance (25%). We also examined other expected changes in stock performance. For example, we explored the impact on compensation when the firm's stock price increases from a median performance (0%) to an annual return of 10%. We find that the results are generally the same, however, with a smaller magnitude due to the lower level of expected performance. The mean change in compensation due

to stock holdings and stock option holdings are DKK 6.287.265 using the Black and Scholes approach and DKK 2.127.266 using the certainty equivalence approach.

The results reported above rely on 34 firms and 41 observations. In order to avoid that the same firm is represented by more than one observation we repeat our tests allowing each firm to be represented only once. These results (not reported), however, remain identical to the ones reported above.

The main reason for the reduction in sample size is lack of information on stock options and stock holdings, respectively. In order to increase the sample size we repeated our tests including only stock options and stock holdings, respectively. The sample size increases to 61 (56) if we include only stock option holdings (stock holdings). Our results, however, remain robust to the new sample sizes; i.e. identical to the ones reported in table 7 panel A-D. In summary, these additional tests show that the results reported in our study are robust.

Conclusion

Non-UK/US firms are typically not required to disclose information on compensation for individual executives, and hence compensation data on individual executives have not been available for researchers. Through a questionnaire we collect data on stock options and stock holdings in the time period 1999-2001. Thus, we believe that we provide a more reliable measure for the association between pay and performance than most prior non-UK/US studies.

While stock options are frequently used as part of the compensation scheme in the UK and the US, stock options are less popular in Denmark. Less than 50% of the executives in our sample receive stock options as part of their compensation. Danish executives also seem to hold more stocks than stock options in their firms. More than 50% of the executives hold stocks in their firms. This stresses the importance of stock holdings as an incentive pay. Further, the level of pay in Denmark is lower than in the US and the UK. Our findings are consistent with Firth et al. (1996, 292) who argue that the remuneration in Scandinavian countries is lower than in other European countries and the US and that the methods of setting compensation deviate.

Using the certainty equivalence approach we document that traditional equity techniques (Black and Scholes) overvalue holdings of equity-based compensation in Danish companies. Thus, based on Danish compensation data we document that there exists a gap between the *cost* of granting stock options from the viewpoint of the firm and the *value* which executives receive from the same stock option program. While this result can also be found in Hall and Murphy (2002), we believe that our result is interesting as it relies on actual data.

Our pay to performance sensitivity measures are affected by two opposite effects. On the one hand, including stock holdings improve the various sensitivity measures. On the other hand, the effect of including stock holdings (and stock options) is reduced when the certainty equivalence approach is adopted. However, based on our results there is no doubt that the positive effect of including stock holdings on the sensitivity measures dominates the mitigating effect of measuring the value of the stock option holdings and stock holdings by the certainty equivalence approach.

Finally, we demonstrate that Danish executives that hold stock options or stocks in their company experience a strong link between firm performance and pay. This is also consistent with Hall and Liebmann (1998).

One way to expand our study is to explore whether the heavy reliance of stock options and stocks is a cost effective way to compensate management. Since there is a gap between the cost and value of issuing stock options to executives one may conjecture that there exist more cost efficient ways to compensate management. Further, while stocks miss some of the characteristics of stock options (restriction on sales of stocks) our results show that the impact on total pay is significant. Thus, future research may shed light on the influence of stocks on the incentive of the management. For example, is it a better way to align the interest of shareholders and managers than stock options?

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Table 1

Participants in the survey

	Total population	Maximum sample size	Minimum sample size
Number of companies	128	58 (45%)	34 (27%)
Number of respondents	283	77 (27%)	41 (14%)
Number of companies with more than one respondent	15	15	6

Table 2

Age and level of experience of the executives

	Mean	Median	Standard deviation	Minimum	Maximum
Age of respondent	49.8	50.0	7.3	34.0	65.0
Years of employment	10.4	8.0	10.4	1.0	43.0

Table 3

Number of respondents categorised by industry

Industry	Number of respondents	Number of companies in industry per 12/29-2001	Coverage
Materials	5	8	62.5%
Industrials	24	56	42.9%
Consumer discr.	8	29	27.6%
Consumer staples	4	15	26.7%
Health care	10	13	76.9%
IT	7	15	46.7%
Telecom.	0	1	0.0%
Utilities	0	2	0.0%
Total	**58**	**139**	**41.7%**

Table 4

Panel A

Number executives receiving either bonus, stock options or stock ownership

Bonus	41
Stock options	39
Stock ownership	50

Panel B

Sample categorized by structure of compensation package - categories are: Bonus, Stock options and stock ownership

No performance pay	7
All categories of performance pay	18
Bonus and stock options	10
Bonus and stock ownership	7
Stock options and stock ownership	7
Bonus	6
Stock options	4
Stock ownership	18
Total number of respondents	**77**

Table 5

Panel A

Categorized level of salary in DKK '000

DKR 000s	**1999**	**2000**	**2001**
0 – 750	6	3	3
750 - 1.500	21	24	26
1.500 - 2.250	17	26	28
2.250 - 3.000	5	7	12
3.000 - 3.750	2	2	4
3.750 - 4.500	0	2	0
4.500 - 5.250	0	0	2
5.250 - 6.000	0	0	0
6.000 -	0	0	0
Total number of respondents	**51**	**64**	**75**

Panel B

(n=56-77)	Mean	Median	Standard deviation
Bonus as a percentage of salary (2001)	10.2	0.0	19.2
Percent owned by executives	3.7	0.1	11.2
Stock option holdings by executives (DKK mio)	1.1	0.0	3.6

Table 6

Composition of 2001 compensation assuming stock price performance at the given percentiles (n=41)

Panel	Percentiles	10	25	50	MEAN	75	90
	% Change in stock price	-42%	-21%	0%	14%	25%	61%
	Mean salary	DKK 1.746.951	DKK 1.746.951	DKK 1.746.951	DKK 1.746.951	DKK 1.746.951	DKK 1.746.951
	Mean Bonus	DKK 71.341	DKK 71.341	DKK 71.341	DKK 71.341	DKK 71.341	DKK 71.341
A	Increase in Black Scholes value of:						
	Options	(DKK 514.865)	(DKK 259.839)	DKK 28.862	DKK 226.854	DKK 385.189	DKK 930.687
	Stock	(DKK 23.358.974)	(DKK 11.917.854)	DKK 0	DKK 7.811.136	DKK 13.904.151	DKK 34.087.583
	Total compensation	(DKK 22.055.546)	(DKK 10.359.401)	DKK 1.847.155	DKK 9.856.283	DKK 16.107.633	DKK 36.836.563
	Increase in Certainty equivalence value of:						
B	Options	(DKK 240.776)	(DKK 217.914)	(DKK 183.283)	(DKK 155.302)	(DKK 130.918)	(DKK 36.807)
	Stock	(DKK 8.317.709)	(DKK 3.959.329)	DKK 577.364	DKK 3.549.446	DKK 5.867.198	DKK 13.541.978
	Total compensation	(DKK 6.740.192)	(DKK 2.358.950)	DKK 2.212.374	DKK 5.212.436	DKK 7.554.573	DKK 15.323.463
C	Options	(DKK 316.266)	(DKK 275.940)	(DKK 221.274)	(DKK 179.946)	(DKK 145.240)	(DKK 18.046)
	Stock	(DKK 8.274.626)	(DKK 3.862.036)	DKK 720.439	DKK 3.718.487	DKK 6.054.789	DKK 13.782.951
	Total compensation	(DKK 6.772.599)	(DKK 2.319.684)	DKK 2.317.457	DKK 5.356.834	DKK 7.727.842	DKK 15.583.198
D	Options	(DKK 357.568)	(DKK 313.775)	(DKK 253.172)	(DKK 206.952)	(DKK 168.003)	(DKK 24.564)
	Stock	(DKK 8.446.435)	(DKK 2.733.208)	DKK 3.217.755	DKK 7.117.929	DKK 10.160.128	DKK 20.237.073
	Total compensation	(DKK 6.985.710)	(DKK 1.228.691)	DKK 4.782.876	DKK 8.729.269	DKK 11.810.418	DKK 22.030.801
E	Options	(DKK 408.090)	(DKK 343.094)	(DKK 259.850)	(DKK 199.034)	(DKK 148.896)	DKK 30.601
	Stock	(DKK 8.471.130)	(DKK 2.719.611)	DKK 3.263.116	DKK 7.181.112	DKK 10.235.968	DKK 20.349.038
	Total compensation	(DKK 7.060.927)	(DKK 1.244.413)	DKK 4.821.558	DKK 8.800.370	DKK 11.905.365	DKK 22.197.932

B Given: Risk aversion of 3 - wealth invested in company of 75% - wealth in all DDK 5 Million
C Given: Risk aversion of 3 - wealth invested in company of 50% - wealth in all DDK 5 Million
D Given: Risk aversion of 2 - wealth invested in company of 75% - wealth in all DDK 5 Million
E Given: Risk aversion of 2 - wealth invested in company of 50% - wealth in all DDK 5 Million

Table 7

Panel *Four measures of the pay to performance relationship for 2001 if firm moves from 50th percentile to 75th percentile performance (from a 0% return to a 25% return)*

A	using Black & Scholes as valuation approach						
	One year dollar change in compensation						
	-50th to 75th, options	356.327	-	-	-	28.374	526.865
	-50th to 75th, options + Stock	14.286.872	-	28.374	594.750	6.156.856	26.929.000
	using Certainty equivalence as valuation approach Assumptions are: Risk aversion 3, wealth in firm 75% and wealth in all DKK 5 mio.						
	-50th to 75th, options	52.382	-	-	-	2.330	28.641
	-50th to 75th, options + Stock	5.342.429	-	2.330	71.313	1.086.037	11.247.345
B	One year per-cent change in compensa-tion	using Black & Scholes as valuation approach					
	-50th to 75th options	32,35%	0,00%	0,00%	0,00%	1,52%	24,99%
	-50th to 75th options + Stock	1087,40%	0,00%	1,52%	24,99%	328,37%	1666,63%
	using Certainty equivalence as valuation approach Assumptions are: Risk aversion 3, wealth in firm 75% and wealth in all DKK 5 mio.						
	-50th to 75th options	1,58%	0,00%	0,00%	0,00%	0,12%	1,16%
	-50th to 75th options + Stock	296,81%	0,00%	0,12%	6,08%	97,62%	805,65%

C

Percentage change in compensation divided by Percentage change change in market value	using Black & Scholes as valuation approach					
	Elasticity					
-50th to 75th options	1,29	0,00	0,00	0,00	0,06	1,00
-50th to 75th options + Stock	43,50	0,00	0,06	1,00	13,13	66,67

using Certainty equivalence as valuation approach
Assumptions are: Risk aversion 3, wealth in firm 75% and wealth in all DKK 5 mio.

-50th to 75th options	0,06	0,00	0,00	0,00	0,00	0,05
-50th to 75th options + Stock	11,87	0,00	0,00	0,24	3,90	32,23

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DKK change in compensation for DKK 1000 change in market value	using Black & Scholes as valuation approach					
-50th to 75th options	DKK 0,33	DKK 0,00	DKK 0,00	DKK 0,00	DKK 0,02	DKK 0,63
-50th to 75th options + Stock	DKK 69,43	DKK 0,00	DKK 0,06	DKK 1,91	DKK 24,07	DKK 233,72

using Certainty equivalence as valuation approach
Assumptions are: Risk aversion 3, wealth in firm 75% and wealth in all DKK 5 mio.

-50th to 75th options	DKK 0,02	DKK 0,00	DKK 0,00	DKK 0,00	DKK 0,00	DKK 0,03
-50th to 75th options + Stock	DKK 32,19	DKK 0,00	DKK 0,01	DKK 0,29	DKK 3,26	DKK 123,15